SD 431.5
A2W4

TIMBER MANAGEMENT PLAN

WHITE RIVER WORKING CIRCLE

White River National Forest

Colorado

Region 2

July 1, 1962 - June 30, 1972

REGION TWO

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

2410

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Colorado

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July 1, 1962 - June 30, 1972

Submitted: January 15, 1962, By /s/ N. Rouillier

Reviewed and Recommended for Approval:

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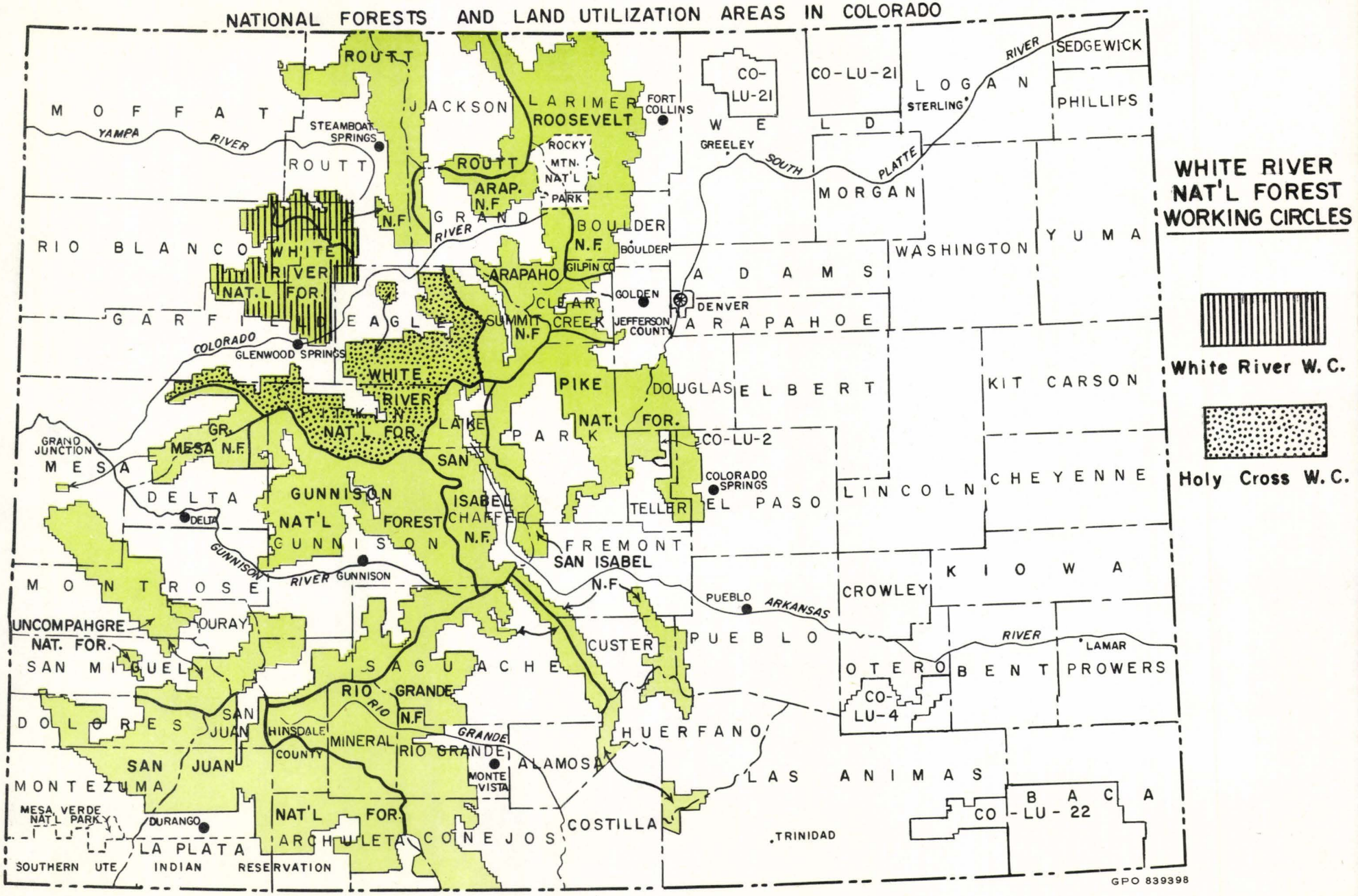
NATIONAL FORESTS AND LAND UTILIZATION AREAS IN COLORADO
WHITE RIVER NAT'L FOREST WORKING CIRCLES
White River W. C.
Holy Cross W. C.
ROUTT
JACKSON
LARIMER
ROOSEVELT
MOFFAT
STEAMBOAT SPRINGS
YAMPA RIVER
FORT COLLINS
CO-LU-21
CO-LU-21
LOGAN
STERLING
SEDGEWICK
PHILLIPS
RIVER
GREELEY
SOUTH PLATTE
ROCKY MTN. NAT'L PARK
ARAP. N.F.
GRAND RIVER
BOULDER
BOULDER
MORGAN
WASHINGTON
YUMA
RIO BLANCO
WHITE RIVER NAT'L FOR.
N.F.
GILPIN CO
ARAPAHO
CLEAR CREEK
SUMMIT N.F.
GOLDEN
DENVER
JEFFERSON COUNTY
ADAMS
ARAPAHOE
GARFIELD
EAGLE
COLORADO
GLENWOOD SPRINGS
WHITE RIVER NAT'L FOR.
PIKE NAT. FOR.
DOUGLAS
ELBERT
KIT CARSON
GRAND JUNCTION
MESA
GR. MESA N.F.
LAKE PARK
CO-LU-2
COLORADO SPRINGS
DELTA
GUNNISON NAT'L FOREST
SAN ISABEL CHAFFEE N.F.
TELLER
EL PASO
LINCOLN
CHEYENNE
DELTA
GUNNISON
GUNNISON RIVER
FREMONT
SAN ISABEL N.F.
MONTROSE
PUEBLO
ARKANSAS RIVER
CROWLEY
KIOWA
UNCOMPAHGRE NAT. FOR.
OURAY
SAN MIGUEL
SAGUACHE
CUSTER
PUEBLO
OTERO
BENT
PROWERS
LAMAR
RIO GRANDE N.F.
DOLORES
SAN JUAN
HINSDALE COUNTY
MINERAL
RIO GRANDE
HUERFANO
CO-LU-4
SAN JUAN
MONTEZUMA
ALAMOSA
MONTE VISTA
LAS ANIMAS
MESA VERDE NAT'L PARK
DURANGO
NAT'L FOR.
ARCHULETA
CONEJOS
COSTILLA
BACA
CO-LU-22
TRINIDAD
LA PLATA
SOUTHERN UTE INDIAN RESERVATION
GPO 839398

SUMMARY OF PLAN

Table 1

Annual Allowable Cut From Regulated Types

Type	Area Acres	Volume Cubic Feet M C.F.	Volume Bd.Ft. Scrib.Dec. C M B.F.
Spruce-Fir Sawtimber (SF9)	430	1,300	4,800
Dead Spruce (DS)	4,000	14,000	--
Total	4,430	15,300	4,800

Volume By Species From Regulated Area

Species	Spruce-Fir Sawtimber Type M B.F.	Dead Spruce Type M C.F.
Engelmann Spruce, live	3,535	1,120
Engelmann Spruce, dead	--	10,220
Subalpine Fir, live	1,055	2,100
Lodgepole Pine, live	205	420
Douglas-fir, live	20	--
Total Conifers	4,815	13,860
Aspen, live	185	140
Grand Total	5,000	14,000

Table 2

Total Area and Volume In Unregulated Types

Type	Area M Acres	Volume MM C.F.
Douglas-fir Sawtimber	12	17
Lodgepole Pine	13	15
Aspen	160	84
Total	185	116

Table 3

Area Summary By Ownership, Land Classification and Stand Size Class

Thousand Acres

Land Classification and Stand Size Class	Ownership			Total
	National Forest	County	Private	
Commercial Forest Land				
Sawtimber	52			52
Poletimber	196		4	200
Seedling-Sapling	14		1	15
Nonstocked	1			1
Unclassified*	138			138
Total	401	-	5	406
Reserved				
Productive	54			54
Non-productive	4			4
Non-forest	42			42
Total	100	-	-	100
Noncommercial	56	1	2	59
Non-forest	164	-	6	170
Grand Total	721	1	13	735

*Dead spruce type.

Table 4

Area of Commercial National Forest Land By Timber Type, Stand Size and Stocking Class

(Acres)

Timber Type	National Forest Lands																	
	Large Sawtimber				Small Sawtimber				Poletimber				Seedling-Sapling				Non-stock.	Total
	Well	Med.	Poor	Tot.	Well	Med.	Poor	Total	Well	Med.	Poor	Total	Well	Med.	Poor	Total		
Douglas-fir	65	274	35	374	275	1,833	9,261	11,369	2,262	1,918	2,759	6,939					70	18,752
Lodgepole Pine						15	818	833	6,328	4,247	1,334	11,909	45	45	134	224		12,966
Spruce-Fir	40	20	30	90	964	11,852	18,578	31,394	10,460	8,015	6,452	24,927	210	252	850	1,312	1,273	58,996
Dead Spruce*																		137,895
Aspen**								7,585				152,130				12,957		172,672
Total	105	294	65	464	1,239	13,700	28,657	51,181	19,050	14,180	10,545	195,905	255	297	984	14,493	1,343	401,281

* Dead spruce not typed by stand size classes -- the salvable dead spruce is largely sawtimber size.

**Aspen not typed by stocking classes.

Table 5

Total Volume For Commercial Forest Lands
By Ownership and Species Group

Species Group and Ownership	Cubic Foot		Board Foot	
	Trees 5.0-10.9"D.B.H.	Trees 11.0+ D.B.H.	Trees 11.0"+D.B.H. Int. $\frac{1}{4}$"	Scribner
	MM C.F.	MM C.F.	MM B.F.	MM B.F.
Softwood Types				
National Forest	188	568	438	375
Private	1	1	--	--
Total	189	569	438	375
Hardwood Types				
National Forest	48	37		
Private	1	1		
Total	49	38	--	--
Grand Total				
National Forest	236	605	438	375
Private	2	2	--	--
Total	238	607	438	375

Table 6

Total Volume of Sawtimber By Species in Sawtimber Types
National Forest Unreserved Lands

Thousand Board Feet

Sawtimber Types	Species: Douglas-fir	Ponderosa Pine	Lodgepole Pine	Subalpine Fir	Engelmann Spruce	Aspen	Total
Douglas-fir	49,522	4,634	1,327	816	1,518	88	57,905
Lodgepole Pine	1	-	4,550	472	508	28	5,559
Spruce-Fir	1,595	-	15,273	77,816	261,171	13,588	369,443
Aspen	382	-	-	8,323	-	39,037	47,742
Total	51,500	4,634	21,150	87,427	263,197	52,741	480,649

Table 7

Periodic Annual Net Growth Based on Past 10 Years
For Trees 5.0" D.B.H. and Larger

Type	Average Net Growth Per Acre: Cubic Feet	Total Annual Net Growth M C.F.
Lodgepole Pine Poletimber	12.81	153
Spruce-Fir Sawtimber	15.89	492

Table 8

Recommended Rotation and Adjustment Period

Type	Adjustment Period	Rotation
Spruce-Fir	50 years	140 years
Dead Spruce	25 years	

Revision Date

This plan will be revised by June 30, 1972. Revision may be made prior to this date if necessary because of changing conditions.

TIMBER MANAGEMENT PLAN

WHITE RIVER WORKING CIRCLE

White River National Forest

INTRODUCTION

The White River Working Circle is unique in that the timber on one-third of the commercial forest land and one-half of the reserved area has been killed by the Engelmann spruce bark beetle. Most of the dead Engelmann spruce, although still standing, is not merchantable for lumber but is merchantable pulp for pulpwood or other similar products. Fifty percent of the total cubic foot volume in trees 5.0" d.b.h. and larger is in beetle-killed spruce.

The major timber management jobs are to put the dead spruce, Douglas-fir and aspen types back into production.

This working circle plan is a ten-year action program. The action prescribed is needed to meet the long term objectives in the General Timber Management Statement for the White River National Forest.

The plan will be revised by no later than June 30, 1972. Earlier revisions may be made if necessary to meet changing conditions.

Detailed Forest Survey data from which this plan was formulated are on the IBM sheets labeled "1958, Forest Survey, Colorado, IBM Sheets, White River National Forest, Sample Unit 29." They are bound and filed in the forest supervisor's office at Glenwood Springs, Colorado.

Compartment records containing maps, volume, type areas and compartment descriptions are filed in the timber management atlas of this working circle. These records will be kept current annually for action taken within the compartments. The current actions recorded are -- area and volume cut, both regulated and unregulated; stand improvement work done; losses from fire, etc., and changes in ownership. This action will be recorded in graphic and tabular form.

The working circle records will be maintained in the offices of the district rangers concerned.

SUMMARY OF RESULTS UNDER PREVIOUS PLANS

This working circle is made up of the major portions of the old White River National Forest. Prior to 1954 the area was divided into five working circles. In 1954 the Bear River and Williams River Working Circles were transferred to what is now known as the Yampa River Working Circle of the Routt National Forest. In 1959 the Colorado River, Dotsero and White River Working Circles were consolidated into one to be known as the White River Working Circle.

The Engelmann spruce bark beetle epidemic of the 1940's and early 1950's made the management plans obsolete. This is the first revision since the epidemic.

Timber cutting during the past ten years has been largely in the dead spruce. Between 1949 and 1961 some 264,000 cords of dead spruce were salvaged and shipped to the pulp industry in Wisconsin.

The demands from the Lake States markets discontinued in 1959.

Only limited timber stand improvement work was accomplished during the past decade. This consisted of planting some 450 acres to spruce and lodgepole pine and 117 acres of direct seeding. Special logging requirements were in effect in the dead spruce type in order to prevent excessive logging damage to the live trees in the stand.

Protection

During the 10-year period, 1951-1960, there were 102 fires in this working circle, 71 of which occurred on commercial timber land. These 71 fires burned a total of 242 acres. The fire occurrence by timber types was --

Type	No. of Fires	Percent of Fires: Total	Acres Burned
Engelmann Spruce	3	4	139
Dead Spruce	56	79	34
Lodgepole Pine	7	10	2
Douglas-fir	5	7	67
Total	71	100	242

Forty eight of these 71 fires, or 68%, were man-caused.

Insect control work has been limited to the Engelmann spruce bark beetle and the Black Hills bark beetle in the scattered ponderosa pine.

TEN-YEAR MANAGEMENT OBJECTIVES

The long range objective of this plan is to attain the sustained yield capacity of the working circle. The immediate 10-year objective is to make all practicable progress toward attaining optimum growing conditions on commercial timber areas and to provide for protecting these areas from such destructive agents as fire, disease and insects. To accomplish this objective, the following must be done during this planning period.

1. Work with the adjacent forests and the regional office towards the establishment of a pulp mill, or similar wood utilization industry, on the Colorado River that will utilize insect-killed Engelmann spruce and green lodgepole pine, spruce, aspen and associated species. Such an operation is necessary for converting 80 percent of the commercial forest land from wild to managed stands.

2. Attain the allowable cut objective for spruce-fir sawtimber type by F.Y. 1972.

3. Assure an adequate stocking within three years after cutting of all current and future timber sale areas by using approved methods of ground preparation. Plant approximately 300 trees per acre, where needed, on spruce-fir cutover areas to assure the regeneration of the area.

4. Reforest some 600 acres of nonstocked and poorly stocked spruce-fir type.

5. Reforest some 600 acres of cutover dead spruce type that are not now adequately stocked.

6. Make a condition class survey of the aspen and Douglas-fir types and include management recommendations for the two types in the compartment records. Stand improvement needs will be incorporated in the three-year action plan.

7. Salvage by sales all spruce blowdowns, of merchantable volumes, currently for the prevention of insect build-up.

8. Control dwarfmistletoe and stem canker in lodgepole pine by commercial sales.

9. Provide adequate fire protection of the area as prescribed in the forest's fire control plans.

REGULATION

Regulation will be by area, with the allowable cut expressed in both area and volume. Control will be by 10-year periods. Undercuts that have built up during the period may be cut during the remainder of the same period, provided that the total cumulative cut does not exceed the allowable periodic cut by more than 10 percent. The control of the allowable cut will be by type area and not by species or products cut within the type. Sales programs will be by species and products and will be in volumes sufficient to meet area control objectives. Sales programs will normally exceed allowable cut objectives; otherwise the average annual cut will fall short of meeting the 10-year objective. Emphasis will be placed on increasing the current actual cut until experience shows the allowable cut objectives are assured.

The financed cut for any one year is based upon volume and includes the cut from both the regulated and unregulated areas. The financial cut quota should be sufficient to meet both volume and area objectives for the forest as a whole.

If the present relationship between area and volume is found to be out of proportion for the forest as a whole, the volume allowable cut will be adjusted to be consistent with area regulation. No adjustment, however, will be made prior to the end of the first five-year period.

Current market demands within the vicinity of the working circle are limited largely to spruce and lodepole pine sawtimber. Due to the lack of lodgepole pine sawtimber type, the allowable cut for the working circle will therefore be limited to the spruce-fir type. Both the live and dead types will be regulated. Although there is no market for the insect-killed spruce at this time, the regulated cut will serve as a guide and not a limiting factor as to what is estimated to be available for cutting annually over a period of 25 years.

The regulated cut for the dead spruce type may be modified to meet long term timber sale contract requirements at the time the material is sold.

There is no foreseeable market for aspen during this planning period. Cutting in this type will not be regulated until a market is developed.

The Douglas-fir type is considered largely inoperable at this time. The type occurs on steep, rocky slopes. The sawtimber size trees are of poor quality due to the excessive number of limbs.

Rotation

Previous plans used a rotation period of 160 years. This plan uses a 50-year period to convert wild stands to managed stands in order to put the area in an acceptable growing condition by the year 2000 A.D.

For the purpose of comparing allowable cuts by the various methods, a 140-year rotation period is used for the spruce-fir type. When better information has been collected, the length of the rotation will be adjusted if needed.

Method of Cutting

Region 2's Management Guide for Engelmann Spruce and Associated Species, FSH2 2442.8 will be applied in designating timber for harvesting. These guides provide for clear cutting by patches, strips or groups with even-age management as the objective.

Timber management within roadsides, recreation areas, streamsides and water fronts will be for the purpose of protecting, improving, and maintaining stands of timber that will be adequate for the use to be made of the area.

Timber cutting within established recreation areas will be in accordance with the objectives set up in the recreation plan for the specific area.

It is essential that a good timber management job be done in order to maintain good aesthetics in areas used by the general public. A complete slash disposal job will be accomplished immediately after logging in the special treatment areas. This may be by piling and burning, chipping or other approved methods.

The Regional Forester and Forest Supervisor are authorized to make sales within their authorizations within the roadside zones of system roads, including Highways U.S. 6 and 24, ~~for the purpose of protecting, improving, and maintaining stands of timber.~~

There are 54,000 acres of productive forest land within the Flat Top Wilderness area. In 1950 and 1956 the Chief authorized the salvaging of salvable dead spruce for the two large pulpwood offerings. The sales did not materialize and no cutting was done. The Chief's approval will be required for any future salvage operations in the wilderness area.

Growing Stock

The forest inventory divides the spruce-fir, lodgepole pine, and Douglas-fir types into stand size and stocking classes. The aspen type is broken into only stand size classes. There is no breakdown within classes for the "dead spruce" type. The stock and stand tables give a description of what is in each type delineation.

The definitions for the various classes are Forest Survey standards in effect at the time of the inventory.

Stand Size Classes

Sawtimber. Stands that have an average net volume per acre of 1,500 board feet (International 1/4" log scale) or more in trees 11.0" and larger d.b.h.

Poletimber. Stands failing to meet sawtimber specifications but at least 10 percent stocked with poletimber-size trees and larger (5.0"+ d.b.h.). The plurality of cubic foot volume is in trees 5.0"-10.9" d.b.h.

Seedling-Saplings. Stands that do not qualify as either poletimber or sawtimber stands but are at least 10 percent stocked with commercial species 1.0"-4.9" d.b.h.

Nonstocked. Stands that do not meet any of the above qualifications, i.e., normally less than 10 percent stocked.

Tree Size Classes

Sawtimber - Trees 11.0"+ d.b.h.

Poletimber - Trees 5.0"-10.9" d.b.h.

Seedling-Sapling - Trees 1.0"-4.9" d.b.h.

Sawtimber inventory volumes as used in this plan are in trees 9.0"+d.b.h. in the sawtimber type.

Stocking class or crown density class refers to the extent to which growing space is utilized by present growing stock trees of commercial species. The classification is based on the percent of crown closure. The stocking classes for sawtimber stands, as used in this plan, are for the percent of closure of sawtimber crowns. The stocking classes for poletimber and seedling-sapling stands are based on crown closure for all trees, regardless of their size.

Classification	Percent of Crown Closure
Nonstocked	0 to 9
Poorly Stocked	10 to 39
Medium Stocked	40 to 69
Well Stocked	70+

Condition classes were not used in the survey. The breakdown into stand size classes is purely on size and does not reflect the growing potential of the trees into the next larger size class. For example,

the areas of overstocked lodgepole pine poletimber were typed as poletimber. The growth potential of these stands is questionable due to age and stocking. Even if the stocking is reduced, it is questionable if growth could be accelerated.

The operability factor was obtained by estimating the percent of the stands that could be economically harvested during the planning period. The cost of roads in relation to the volume of timber is the determining factor. Some of the stands will not be operable until all-purpose funds make such stands accessible.

Table 9

Distribution of Stand Size Classes
For Regulated Types

Stand Size Class	Spruce-Fir Type		
	Area M Acres	Percent	Operability Percent
Sawtimber	31	16	65
Poletimber	25	12	-
Seedling-Sapling	2	01	-
Nonstocked	1	01	-
Unclassified*	138	70	75
Total	197	100	-

*Dead spruce.

Table 10

Distribution of Stand Size Classes
For the Nonregulated Types

Stand Size Class	Douglas-fir		Lodgepole Pine		Aspen	
	Area M Acres	Percent	Area M Acres	Percent	Area M Acres	Percent
Sawtimber	12	63	1	08	8	5
Poletimber	7	37	12	92	152	88
Seedling-Sapling	-	-	-		13	7
Nonstocked	-	-	-		-	
Total	19	100	13	100	173	100

Growth and Mortality

Growth and mortality are based on Forest Survey data, NFA Table 31 in IBM binder. This is summarized in Table 11.

Most of the mortality during past years was due to the Engelmann spruce bark beetle. The 138,000 acres of "dead spruce" type have a live understory that is putting on normal growth for a wild spruce-fir type. The subalpine fir in the type should be of pulpwood size by the time the dead spruce has been salvaged. The subalpine fir now makes up about 55 percent of the green volume of the type.

Table 11

Adjusted Current Average Annual Growth and Mortality Per Acre
By Major Types

Major Types	Gross Growth		Mortality		Net Growth	
	Board Feet	Cubic Feet	Board Feet	Cubic Feet	Board Feet	Cubic Feet
Douglas-fir Sawtimber	10.72	3.02	2.39	0.89	+ 8.33	+ 2.13
Spruce-Fir Sawtimber	124.27	30.52	49.41	14.63	+74.86	+15.89
Lodgepole Pine Poletimber	19.78	13.95	3.70	1.14	+16.08	+12.81
Aspen Sawtimber	12.66	3.86	8.21	3.09	+ 4.45	+ 0.77
Aspen Poletimber	14.60	5.81	3.79	0.53	+10.81	+ 5.28

Note: Board feet is based on Scribner Decimal C log rule.

Calculation of Allowable Cut

Spruce-Fir Type

There are 31,000 acres of spruce-fir sawtimber type in the working circle. It is estimated that only about 65 percent of this can be harvested until an adequate all-purpose road system has been constructed. The allowable cut for this period is based on cutting over approximately 20,000 acres during the next 50 years.

The current annual periodic net growth is approximately 75 board feet per acre. The current annual mortality is 49 board feet. Growth and mortality will be re-examined prior to the end of this planning period, and the 50-year converting period may be adjusted if conditions warrant.

The allowable cut in area and volume is shown in Table 12. This was calculated using a tabulation method.

The annual allowable cut for this 10-year period is --

Area - 430 acres
Volume- 1,300,000 cubic feet.

The cubic foot volume allowable cut is in trees 5.0" and larger d.b.h. This may be converted to board foot volume in trees 9.0" and larger d.b.h. by using a converting factor of 3.98 for Scribner and 4.71 for International $\frac{1}{4}$".

The board foot annual allowable cut is --

Scribner - 4,800 M B.F.
International $\frac{1}{4}$" -6,000 M B.F.

A comparison of the allowable cut based on the tabulation method with other area methods is as follows:

a. Straight area, i.e., total area divided by rotation --

$$\frac{59,000}{140} = 420 \text{ acres per year.}$$

420 acres x 3,030 cu. ft. = 1,270 M C.F. per year.

b. The Kemp formula gives --

$$\frac{31,000 \times 7 + 25,000 \times 5 + 2,000 \times 3 + 1,000}{4 \times 140} = \frac{349,000}{560} = 623 \text{ acres per year.}$$

623 acres x 3,030 cu. ft. = 1,887 M C.F. per year.

Both the straight area and the Kemp formula indicates there should be no reduction in volume after the end of the conversion period.

The green understory in the "dead spruce" type will be advanced poletimber size by the end of the 50-year conversion period. The estimated distribution of the stand size classes at that time will be:

Sawtimber	35	M Acres
Poletimber	100	
Seedling-Sapling	60	
Nonstocked	2	
Total	197	

The Kemp formula gives an annual allowable cut of 1,700 acres when the above estimates are used. This indicates that the allowable cut can be increased four times by the end of the conversion period.

The following shows the volume annual allowable cut of 5,000,000 board feet broken down by species:

Species	Percent	Volume M B.F.
Engelmann Spruce	70.7	3,535
Subalpine Fir	21.1	1,055
Lodgepole Pine	4.1	205
Douglas-fir	0.4	20
Total Conifers	96.3	4,815
Aspen	3.7	185
Grand Total	100.0	5,000

Dead Spruce Type

The allowable cut for the dead spruce type is determined by dividing the total acres by 25 years and multiplying by the average volume per acre. A period of 25 years is used and this is based on the estimated time that the material will remain merchantable for pulpwood.

It is estimated that there are 103,000 operable acres in the type. This divided by 25 years gives an annual allowable cut of approximately 4,000 acres. The estimated volume per acre is 2,661 cubic feet of dead spruce and 984 cubic feet of live associated species, or a total of 3,645. Some of the live trees will be cut along with the dead. This represents 42 cords per acre or an annual volume allowable cut of 165,000 cords.

The allowable cut for the dead spruce type will not be considered as a limitation but as a goal that indicates what could be harvested if the cut is spread out over a 25-year period. From a silvicultural standpoint, a much shorter period would be desirable. This, however, has its economic limitation.

The 165,000 cords are broken into species as follows:

Dead Engelmann Spruce	120 M Cords
Live Engelmann Spruce	13
Live Subalpine Fir	25
Live Lodgepole Pine	5
Live Aspen	2
Total	165 M Cords

Conversion from cubic feet to cords is on the assumption that there is 85 cubic feet of solid wood in 128 cubic feet of stacked wood.

Calculation of Volume in Nonregulated Types

The Douglas-fir, lodgepole pine and aspen types are not scheduled for regulation during this planning period. The area of these types was multiplied by the volume as shown in the stock and stand tables,and the volume is summarized in Table 2.

This plan will be revised and these types will be put under regulation as soon as a market for the wood is developed.

Dead Spruce Volumes in Reserved National Forest Land

Approximately 47,000 acres of land in the Flat Top Wilderness area was delineated on the aerial photograph as a "Dead Spruce" type. The average volume per acre is 2,660 cubic feet of insect-killed spruce. This volume is now salvable for products such as pulpwood.

The total volume is 47,000 acres x 2,660 cubic feet = 125 MM C.F.

Table 12

Allowable Cut By Area and Cubic Foot Volume
For 10-Year Periods

10-Year Period	Type	Area To Be Cut	Volume Per Acre: Beginning of Period	Volume Per Acre: Net Growth	Volume Per Acre: Total	Total Volume For Period
		M Acres	C.F.	C.F.	C.F.	M C.F.
1st	Spruce-Fir	4.3	2,951	79	3,030	13,000
	Dead Spruce	40.0	3,645	-	3,645	140,000
2nd	Spruce-Fir	4.1	3,110	79	3,189	13,000
	Dead Spruce	40.0	3,645	-	3,645	140,000
3rd	Spruce-Fir	3.9	3,269	79	3,348	13,000
	Dead Spruce	23.0	3,645	-	3,645	80,000
4th	Spruce-Fir	3.8	3,428	79	3,507	13,000
5th	Spruce-Fir	3.6	3,587	79	3,666	13,000

Total Area
Spruce-Fir 19,700 acres
Dead Spruce 103,000 acres

Annual Cubic Foot Allowable Cut Converted To Board Feet

Scribner Dec. C = 1,300 M C.F. x 3.98 = 5,000 M B.F.
International $\frac{1}{4}$" = 1,300 M C.F. x 4.71 = 6,000 M B.F.

Cutting Budget

The cutting budget for the first 10-year period is shown in Table 13. The compartments are not necessarily listed in priority sequence since three ranger districts are involved. At present, two operations in the working circle are cutting less than a million board feet per year. It will be necessary to introduce at least two more operations to reach the allowable cut of 5,000 M B.F.

A 10-year cutting budget is also shown for the dead spruce type, Table 14. The compartments are listed in the order in which they most likely would be logged, considering present roads and a logical sequence of road building.

Table 13

10-Year Cutting Budget, Spruce-Fir Type

White River Working Circle

Compartment Number	Compartment Name	Ranger District	Spruce-Fir Sawtimber Type Area in Acres		Volume to be Cut M B.F.
			Gross	Net	
008	Red Dirt	Glenwood	290	188	2,000
023	Beaver Creek	Blanco	926	602	7,000
039	Rifle Creek	Rifle	2,189	1,423	17,000
040	West Elk Creek	Rifle	3,210	2,087	24,000
Total			6,615	4,300	50,000

Table 14

10-Year Cutting Budget, Dead Spruce Type

White River Working Circle

Compartment Number	Compartment Name	Ranger District	Dead Spruce Type Area in Acres		Volume to be Cut
			Gross	Net	M C.F.
015	Coffee Pot	Glenwood	2,200	1,650	6
017	Grizzly Creek	Glenwood	5,300	3,975	14
016	No Name	Glenwood	3,400	2,550	9
045	Canyon Creek	Glenwood	4,400	3,300	12
046	Transfer Spring	Glenwood	1,000	750	2
013	Coburn Country	Glenwood	1,600	1,200	4
012	Lake Creek	Glenwood	1,500	1,125	4
011	Dry Sweetwater	Glenwood	933	700	2
010	Sweetwater	Glenwood	6,800	5,100	18
009	Turret Creek	Glenwood	8,500	6,375	22
008	Red Dirt	Glenwood	4,400	3,300	12
006	South Derby	Glenwood	3,100	2,325	8
005	Middle Derby	Glenwood	7,600	5,700	20
004	North Derby	Glenwood	2,600	1,950	7
Total			53,333	40,000	140

TRANSPORTATION

Table 15 shows the road surveys and construction needed to attain the budgeted cut.

Until such time that the forest's all-purpose road system is completed, it will be necessary to coordinate the timber sales program with existing roads and those that can be built by the purchaser. The only large volume of timber that will amortise a road system is the dead spruce. The other timber is patchy and limited in volume. The timber will hardly justify more than a low standard road. When a higher standard road is necessary for all-purpose use, the difference in cost will come from available Federal funds.

Rights-of Way

Table 16 shows the rights-of-way needed in order to remove the timber budgeted for cutting during this planning period. The years the rights-of-way will be needed are also shown with the exception of the dead spruce area. Rights-of-way for the dead spruce will be scheduled at the time a market is developed for the product.

Table 15

Timber Access Road Development Program - Spruce-Fir Type
F.Y. 1963 - 1972

White River Working Circle

Compartment		Road			Constr.	Est.	Estimated Cost		Date Survey	
Name	No.	Name	No.	Class	By	Miles	Per Mi.	Total	Required	Remarks
Red Dirt	008	Horse Lake	*3076	SN	Contract	15	7,000	105,000	F.Y.1964	Sell F.Y. 1966
Red Dirt	008	Little Sugarloaf	*3077	SN	Contract	5	14,000	70,000	F.Y.1964	Sell F.Y. 1966
Rifle Creek	039	Wagon Road	3039	SN	Purchaser	3	9,000	27,000	F.Y.1964	Sell F.Y. 1965
Rifle Creek	039	Harris Gulch	3040	SN	Purchaser	9	7,000	63,000	F.Y.1966	Sell F.Y. 1967
Rifle Creek	039	East Rifle Creek	3041	SN	Contract	6	10,000	60,000	F.Y.1968	Sell F.Y. 1970
West Elk Creek	040	Clark Creek	3046	SN	Contract	6	8,000	48,000	F.Y.1966	Sell F.Y. 1968
West Elk Creek	040	Clark Ridge	3047	SN	Contract	13	7,000	91,000	F.Y.1968	Sell F.Y. 1969
West Elk Creek	040	Meadow Lake	3048	SN	Contract	9	6,000	63,000	F.Y.1969	Sell F.Y. 1970
Beaver Creek	023	Sawmill Hill	3005	SN	Purchaser	4	6,000	24,000	F.Y.1964	Sell F.Y. 1965
Beaver Creek	023	East Beaver Creek	3007	SN	Purchaser	1	9,000	9,000	F.Y.1967	Sell F.Y. 1969
Beaver Creek	023	Ellison Mountain	3009	SN	Purchaser	2	8,000	16,000	F.Y.1967	Sell F.Y. 1969
Beaver Creek	023	Pattison Park	3010	SN	Contract	5	7,000	35,000	F.Y.1967	Sell F.Y. 1969
Beaver Creek	023	Big Beaver	3276	SN	Contract	7	6,000	42,000	F.Y.1966	Sell F.Y. 1968
Beaver Creek	023	Sleepy Cat	3004	SN	Contract	31	8,000	248,000	F.Y.1966	Sell F.Y. 1968

*Also needed and included under Dead Spruce Type.

Table 15 (Continued)

Timber Access Road Development Program - Dead Spruce Type
F.Y. 1963-1972

White River Working Circle

Compartment		Road			Constr.	Est.	Estimated Cost		Date Survey
Name	No.	Name	No.	Class	By.	Miles	Per Mi.	Total	Required
Canyon Creek	045	Boiler Creek Ridge	3054	SN	Contract	13	10,000	130,000	**
Upper South Fork	033	Dry Buck Creek	3055	SN	Purchaser	14	7,000	98,000	**
Upper South Fork	033	Bison Lake	3056	SN	Purchaser	8	4,000	32,000	**
Coffee Pot	015	Baxter Mountain	3057)	SN	Purchaser	23	10,000	230,000	**
No Name	016	Baxter Mountain	3057)						
Sweetwater	010	Indian Camp	3066)	DH	Contract	8	20,000	160,000	**
Dry Sweetwater	011	Indian Camp	3066)						
Grizzly Creek	017	Wagon Gulch	3069	SN	Purchaser	5	12,000	60,000	**
Coburn Country	013	Lower Short Creek	3072	SN	Purchaser	8	12,000	96,000	**
Lake Creek	012	Coburn	3073	SN	Purchaser	10	10,000	100,000	**
Middle Derby	005	Middle Fork Derby	3075	SN	Purchaser	12	10,000	120,000	**
South Derby	006	Horse Lake	*3076	SN	Purchaser	15	7,000	105,000	**
Red Dirt	008	Little Sugarloaf	*3077	SN	Purchaser	5	14,000	70,000	**
North Derby	004	North Derby	3263	SN	Purchaser	2	10,000	20,000	**
Upper South Fork	033	Blair Lake	3291	SN	Purchaser	3	8,000	24,000	**

*Also needed and included under Spruce-Fir Type.
**Dependent on sale of Dead Spruce for pulpwood.

Table 16

Timber Access Roads Right-of-Way Needs - Spruce-Fir Type

Compartment		Road		No. Ease-ments	Volume MM B.F.	Year Needed
Name	No.	Name	No.			
Beaver Creek	023	Sawmill Hill	3005	2	7	1964
Beaver Creek	023	East Beaver Creek	3007	2		1967
Rifle Creek	039	Harris Gulch	3040	1	17	1966
West Elk Creek	040	Clarke Creek	3046	1		1966
Beaver Creek	023	Big Beaver	3276	1	24	1966
Canyon Creek	045	Boiler Creek Ridge	3054	2		*
Coffee Pot	015	Baxter Mountain	3057	1		*
Sweetwater	010	Indian Camp	3066	2		*
Coburn Country	013	Lower Short Creek	3072	1		*
Lake Creek	012	Coburn	3073	2		*
Middle Derby	005	Middle Fork Derby	3075	1		*
North Derby	004	North Derby	3263	1		*

*Dependent on sale of Dead Spruce for pulpwood.

SALES POLICY

The sawtimber operation within the working circle will normally be limited to mills requiring relatively small volumes of timber. The reason for this is the small volumes of scattered timber of sawtimber size.

The present industry consists of two small mills -- one cutting about one-half million board feet per year and the other less than 100 M B.F. Additional sawmill capacity that will cut at least four million feet per year is needed.

Timber offerings in sale sizes up to 10 million board feet will be put up to increase the cut of sawtimber.

Points of appraisals will generally be limited to towns such as Rifle, Newcastle, Burns and Meeker.

The dead spruce has been offered for sale twice as a large offering under a long term contract. Final award of the sale was never made.

The dead spruce will be offered again for sale whenever there appears to be reasonable demand for the material. The offering will be for a large volume under a long term contract. In the meantime, sales will be limited in size to meet local demands for mine timbers.

Merchantability Specifications

Product and Species	Specification
Sawtimber and Dead Spruce	Trees
All Species	10.0 inches d.b.h.
All Species	Top Diameter 8.0 inches d.i.b.
All Species	Stump Height 12.0 inches
Pulpwood	Trees
All Species except dead spruce	5.0 inches d.b.h. and having at least one stick 8.0 feet long
All Species	Top Diameter 4.0 inches d.o.b.
All Species	Stump Height 8.0 inches

Logging Methods

Logging will be done in all types by trucks, animals, tractors and cable equipment. The method to be used will be discussed in the presale prescription and prospectus and will be specified in the timber sale contract.

In the spruce-fir type, special consideration will be given to practices and methods which will eliminate potential build-up of Engelmann spruce bark beetle populations in cull and large slash material. Complete slash disposal, entire tree skidding with slash and cull disposal at the landings, or other appropriate methods will be considered for approval on an individual case basis.

TIMBER STAND IMPROVEMENT

Reforestation

The total planting job to be done by 1980 and that planned for accomplishment during the current 10-year period are shown in Table 17.

For the 10-year period, scarifying, slash burning or other means to obtain natural reproduction will be done on 1,000 acres of spruce-fir type.

Thinning

Advantage will be taken of small sales for posts, poles and mine props to accomplish commercial thinnings in the lodgepole pine type.

Table 17

The 10-Year Planting Job - 1963 - 1972

Types	Non-stocked	Understocked Seedling-Saplings	Poletimber Size Stands To Be Clear Cut	Sawtimber Areas Cut Over After 1960	Dead Spruce Cut Over	Re-establish Conifers in Aspen Type	Total
	M Acres	M Acres	M Acres	M Acres	M Acres	M Acres	M Acres
Lodgepole Pine	-	-	1	-	-	-	1
Spruce-Fir	-	-	-	2	-	-	2
Dead Spruce	-	-	-	-	2	-	2
Aspen	-	-	-	-	-	14	14
Total	-	-	1	2	2	14	19

The Total Planting Job - F.Y. 1963 - 1980

Types	Non-stocked	Understocked Seedling-Saplings	Poletimber Size Stands To Be Clear Cut	Sawtimber Areas Cut Over After 1960	Dead Spruce Cut Over	Re-establish Conifers in Aspen Type	Total
	M Acres	M Acres	M Acres	M Acres	M Acres	M Acres	M Acres
Lodgepole Pine	-	-	4	-	-	-	4
Spruce-Fir	1	1	-	4	-	-	6
Dead Spruce	-	-	-	-	22	-	22
Aspen	-	-	-	-	-	43	43
Total	1	1	4	4	22	43	75

PROTECTION

Insects

The Engelmann spruce bark beetle is at present at an endemic level in the spruce-fir type in all compartments of the working circle. An objective of this plan is to keep these infestations from building up to an epidemic level.

The action to meet this objective will be as follows:

1. Train all field-going personnel in detection and reporting procedures for all species of destructive forest insects native to this area.

2. Train all timber operators and their woods bosses and contractors to recognize and report infestations which might be expected within their operating areas.

3. Train other key people such as stockmen, dude packers and State Game and Fish Department officers to detect and report any unusual destructive insect activity they might notice in their travels.

4. Each district will be required to make, maintain and activate an insect detection plan. The plan will cover potential insect build-up areas, such as around sale areas, cyclone and hurricane damaged areas, and stands of overmature and decadent timber which will be investigated each year to prevent build up to an epidemic level.

5. All future timber sale contracts and modifications of existing contracts in the spruce-fir type will contain special insect control clauses. These clauses will require treatment such as bunching and burning all Engelmann spruce slash and cull material resulting from logging. The method used will be that which is considered most practicable under the conditions existing. Burning will be done by the Forest Service, with cooperative deposits, during a period when the bark beetles are in the cull and slash material.

   On areas where the above does not fully control the bark beetles, and on small sale areas where such action is impracticable, a trap tree program will be used to control the insect.

Disease

Dwarfmistletoe is found in varying amounts in many of the lodgepole pine stands. The following action to effect control of the disease will be taken:

1. Sales With Disease Control -- Sale Area Betterment Provisions

   Control will be by felling, girdling, poisoning or pushing over and burning all infected residual trees. This will be done as part of the sale area betterment work with funds collected for such work.

2. Older Sales With No Disease Control -- Sale Area Betterment Provisions

   The residual trees of commercial size will be sold as soon as practicable. Disease control sale area betterment funds will be collected on all such sales. These funds will be supplemented with regular funds to effect control. A survey will be made to determine the extent of the job and the controls needed. Control measures will be prescribed as a result of this survey. All control work will be accomplished by F.Y. 1972. Some 2,000 acres will need to be examined, and there is a probability that 700 or 800 acres on the Blanco and Glenwood Districts will need treatment.

Animals and Rodents

Porcupines

1. Instruct all Forest Service employees to destroy porcupines when found.

2. Educate the public in the importance of porcupine control in timber management and conservation.

3. Use poison in porcupine dens in the vicinity of all new plantations.

Mice

Check mouse populations and apply poison when it is evident that numbers are reaching a cyclic peak. This will be done around new plantations and seedings, and on areas where natural regeneration is to be obtained.

Livestock

All plantations will be fenced,if necessary,to protect the trees from livestock damage. The fences will be maintained until the trees are above browse height. Areas to be regenerated by natural means may be fenced,if necessary, for the protection of the reproduction against animal damage.

Wildlife

Plantations will not be established on heavily used winter game range.

Fire

It is the objective of this plan to treat all logged areas so that the PAR for the working circle can be maintained. PAR for this working circle is 53 burned acres per year on commercial forest land. To attain this objective, the 10-year program for fire protection will be:

1. Reduce all slash areas to at least a MM fuel type within two years after logging.

2. Maintain a supply of equipment and a protection organization adequate to keep commercial timberland fires within the annual PAR set up in the fire prevention plan.

3. Provide for the purchase of additional slash disposal equipment, such as tankers, chippers, pumps and fire equipment, until sufficient equipment is available to control slash on approximately 2,000 acres per year.

4. Continue the research into and the measurement of cumulative effects in the dead spruce type.

5. On areas where it is not possible to reduce the fire hazard to an acceptable standard, it will be necessary to provide extra protection funds to insure detection and protection during high fire danger and high risk periods.

SUPPORTING DATA

Compartment Records

A system of compartment records will be established for each of the four ranger districts within this working circle. These records will consist of Form R2-2400-19 and a 2-inch-to-the-mile map for each compartment within the district. These will be maintained in an atlas-size binder. The R2-2400-19 will be posted at least once annually. Compartment descriptions will be included as a part of this record.

Timber Inventory

The inventory data on which this plan was made was obtained from the Cooperative Forest Survey -- Region 2 Inventory Program conducted in 1958.

The inventory was conducted to standards prescribed and agreed to by Forest Survey of the Intermountain Forest and Range Experiment Station and the Division of Timber Management of Region 2 (Field Instruction for Forest Inventory, Rocky Mountain Region, 1956). Forest Survey read the plots and processed the data. Region 2 delineated the types on aerial photographs, transferred the types to planimetric maps, printed the final type maps, and calculated the area of the types.

Sampling Error

Volume data was based on two plots taken at each of 238 locations. It was estimated that the number of plots taken would give a sampling error in cubic foot volume of not to exceed five percent (one standard error) for the entire forest. Of the 238 locations in commercial forest land, 77 were on the White River Working Circle and 161 on the Holy Cross Working Circle.

Table 20 shows the number of locations for each volume stratum for the entire forest. The estimated sampling error for this working circle is nine percent.

The area calculations were based upon a 100 percent mapping job.

Data Processing

Forest Survey of the Intermountain Forest and Range Experiment Station processed the data through the IBM Section of the Pacific Southwest Station. This was done in accordance with "Plan for Compilation of the Intermountain Forest Survey, Rocky Mountain Area by IBM Method," dated October 1, 1956, by Robert M. Miller.

The NFA Tables are on file in the forest supervisor's office. These are:

Area

NFA 2 - Compartment Area
NFA 3 - Block Area Summary
NFA 4 - Working Circle Area Summary

Volume

NFA 6 - Average Volume Per Acre By Volume Stratum
NFA 7 - Average Volume Board Foot Volume Per Acre for Sawtimber -Size Trees By Volume Stratum
NFA 31- Average Growth and Mortality Per Acre By Species and Growth Stratum

Miscellaneous Tables - Number of Trees Per Acre and Various Forest Survey Summaries

Copies of the plot tally sheets are on file in the forest supervisor's office.

Aerial photographs on which the photo interpretation was done are on file at the Denver Federal Record Center, Denver, Colorado.

Plates from which the type maps were printed are stored in the Division of Timber Management, Forest Service, Denver, Colorado.

Method for Calculating Periodic Annual Net Growth

NFA Table No. 31 in the IBM binder gives the average adjusted 10-year growth increment and the 10-year mortality by growth stratums, species, and two-inch d.b.h. classes. The volumes are shown in both board feet and cubic feet.

The growth stratum codes are as follows:

GS-01 = All conifer sawtimber stands.
GS-02 = All conifer poletimber stands.
GS-03 = All conifer seedling and sapling and nonstocked stands.
GS-04 = All hardwood stands.

The gross 10-year growth is based upon merchantability class (MC-1) trees. These are all live, merchantable trees. Mortality is shown under merchantability class (MC-7) trees. These are all mortality trees.

The Forest Survey crews estimated the trees that died during the past five years. This volume was then doubled to put it on the same period as the growth. The growth was based on the past 10 years.

The periodic annual net growth per acre can be determined for any given species and d.b.h. class within a growth stratum, or the total of all species in d.b.h. classes within a growth stratum, by subtracting the volume shown for the average 10-year mortality (MC-7) from the average 10-year growth increment (MC-1) and dividing by 10.

Growth stratums do not correspond to volume stratums. The total volume of timber in the working circle and the allowable cuts are based upon volume stratums. It was, therefore, necessary to construct a growth and mortality table for the volume stratums using the data given in NFA Table 31. This was done by weighting the growth and mortality of the species in the growth stratums by the percent of each species in the volume stratums.

Table 18

Relation Between Age Classes and Size Classes
Forest Survey Site Trees

Type	Age Class (Years)	Stand Size Class: Nonstocked No. Trees	Nonstocked Percent	Seedling-Sapling No. Trees	Seedling-Sapling Percent	Poletimber No. Trees	Poletimber Percent	Sawtimber No. Trees	Sawtimber Percent
Douglas-fir	1- 19								
	20- 39					3	21.42		
	40- 59					6	42.86		
	60- 79					2	14.29	6	27.27
	80- 99					2	14.29	1	4.54
	100-119							3	13.64
	120-139							2	9.09
	140-159					1	7.14	3	13.64
	160-179							1	4.54
	180-199							3	13.64
	200+							3	13.64
Total						14	100.00	22	100.00
Lodgepole Pine	1- 19								
	20- 39					3	6.81		
	40- 59					12	27.28	2	3.12
	60- 79					20	45.45	14	21.88
	80- 99					4	9.09	18	28.12
	100-119							2	3.13
	120-139					1	2.27	2	3.13
	140-159							6	9.37
	160-179					2	4.55	1	1.56
	180-199					1	2.27	8	12.50
	200+					1	2.27	11	17.19
Total						44	100.00	64	100.00
Subalpine Fir	1- 19								
	20- 39								
	40- 59					4	44.50	5	9.09
	60- 79			1	50.00	1	11.10	12	21.81
	80- 99			1	50.00	2	22.20	15	27.28
	100-119					2	22.20	10	18.18
	120-139							7	12.73
	140-159							2	3.63
	160-179							3	5.46
	180-199								
	200+							1	1.82
Total				2	100.00	9	100.00	55	100.00

Table Continued

Table 18 (Continued)

Relation Between Age Classes and Size Classes
Forest Survey Site Trees

Type	Age Class (Years)	Stand Size Class: Nonstocked No. Trees	Nonstocked Percent	Seedling-Sapling No. Trees	Seedling-Sapling Percent	Poletimber No. Trees	Poletimber Percent	Sawtimber No. Trees	Sawtimber Percent
Engelmann Spruce	1- 19								
	20- 39	1	33.33	4	100.00	1	4.54		
	40- 59	2	66.67			13	59.09	2	1.92
	60- 79					4	18.18	12	11.54
	80- 99					1	4.55	6	5.77
	100-119							15	14.42
	120-139					2	9.09	11	10.58
	140-159							15	14.42
	160-179							7	6.73
	180-199							10	9.62
	200+					1	4.55	26	25.00
Total		3	100.00	4	100.00	22	100.00	104	100.00
Aspen	1- 19								
	20- 39			3	37.50	3	7.69		
	40- 59			4	50.00	10	25.64	1	5.26
	60- 79			1	12.50	20	51.28	2	10.52
	80- 99					4	10.26	7	36.85
	100-119					1	2.56	3	15.79
	120-139							2	10.52
	140-159					1	2.57	3	15.79
	160-179							1	5.27
	180-199								
	200+								
Total				8	100.00	39	100.00	19	100.00

Table 19

Average Age and Height By Species
For D.B.H. 2-Inch Classes
Forest Survey Site Trees

Stand Size Class	D.B.H. 2" Class	Lodgepole Pine		Engelmann Spruce		Subalpine Fir		Douglas-fir		Aspen	
		Age Years	Height Feet	Age Years	Height Feet	Age Years	Height Feet	Age Years	Height Feet	Age Years	Height Feet
Seedling-Sapling	½' ht. to 0.9" d.b.h.										
	1.0- 2.9										
	3.0- 4.9			34	22					36	25
Poletimber	5.0- 6.9	44	64	53	29	43	35	66	34	57	37
	7.0- 8.9	79	45	52	42	85	44	49	41	71	50
	9.0-10.9	85	49	112	47	106	62	59	48	92	61
Small Sawtimber	11.0-12.9	115	62	124	60	110	73	124	50	97	62
	13.0-14.9	149	65	170	75	105	71	116	58	114	60
	15.0-16.9	133	73	158	76	128	78	127	57	98	69
	17.0-18.9	119	74	200	82	173	67	198	51	67	49
	19.0-20.9			175	86						
Large Sawtimber	21.0-22.9			159	111	116	70				
	23.0-24.9			276	119			185	98		
	25.0-26.9			138	81	185	71	111	78		

Table 20

Area, Volume Per Acre, and Total Volume By Volume Stratum and Ownership

Volume Stratums				Volume Per Acre				National Forest Unreserved Land						Private et.al Lands					
				Board Foot		Cubic Feet			Total Volume						Total Volume				
				Trees 11.0"+							Cubic Feet						Cubic Feet	
			No. of	D.B.H.		Trees	Trees		Int.	Scrib.	Trees	Trees			Int.	Scrib.	Trees	Trees
		Stand	Stock-	Int.	Scrib.	5.0-10.9"	11.0"+	Area	¼"	Dec. C	5.0-10.9	11.0"+	Area		¼"	Dec. C	5.0-10.9	11.0"+
		Size	ing	¼"	Dec. C	D.B.H.	D.B.H.	M	MM	MM	D.B.H.	D.B.H.	M		MM	MM	D.B.H.	D.B.H.
No.	Type	Class	Class	Locations				Acres	B.F.	B.F.	MM C.F.	MM C.F.	Acres		B.F.	B.F.	MM C.F.	MM C.F.
1	Douglas-fir	SST	Med.	3	5,332	4,429	1,302	1,046	2	11	9	3	2					
2	Douglas-fir	SST	Poor	8	4,588	3,896	326	861	9	41	35	3	8					
3	Lodgepole Pine	SST	Well	5	15,084	12,936	2,132	2,703	-	-	-	-	-					
4	Lodgepole Pine	SST	Med.	13	10,140	8,547	1,852	1,815	-	-	-	-	-					
5	Lodgepole Pine	SST	Poor	14	5,675	4,748	1,341	1,017	1	6	5	1	1					
6	Spruce-Fir	LST	All	2	19,018	16,960	649	3,155	-	-	-	-	-					
7	Spruce-Fir	SST	Well	10	19,648	17,025	803	3,428	1	20	17	1	3					
8	Spruce-Fir	SST	Med.	30	16,371	14,092	975	2,866	12	196	169	12	34					
9	Spruce-Fir	SST	Poor	39	8,624	7,372	792	1,520	19	164	140	15	29					
Total Sawtimber				124	9,995	8,523	795	1,750	44	438	375	35	77	0	-	-	-	-
10	Douglas-fir	PT	Well	3			444	402	2			1	1					
11	Douglas-fir	PT	M&P	4			326	141	5			2	1					
12	Lodgepole Pine	PT	Well	6			1,691	550	6			10	3					
13	Lodgepole Pine	PT	Med.	11			1,224	543	4			5	2	1	-	-	1	1
14	Lodgepole Pine	PT	Poor	5			707	153	1			1	-					
15	Spruce-Fir	PT	Well	2			1,113	522	11			12	6					
16	Spruce-Fir	PT	Med.	4			846	490	8			7	4					
17	Spruce-Fir	PT	Poor	9			410	258	7			3	2					
Total Poletimber				44			932	432	44			41	19	1			1	1

(Table Continued)

Table 20 (Continued)

Area, Volume Per Acre, and Total Volume By Volume Stratum and Ownership

Volume Stratums				Volume Per Acre				National Forest Unreserved Land					Private et. al Lands				
				Board Foot		Cubic Feet		Total Volume					Total Volume				
				Trees 11.0"+ D.B.H.							Cubic Feet					Cubic Feet	
			No. of	Int.	Scrib.	Trees 5.0-10.9"	Trees 11.0"+		Int.	Scrib.	Trees 5.0-10.9	Trees 11.0"+		Int.	Scrib.	Trees 5.0-10.9	Trees 11.0"+
		Stand Size	Stock-ing	1/4"	Dec. C	D.B.H.	D.B.H.	Area	1/4" MM	Dec. C MM	D.B.H.	D.B.H.	Area	1/4" MM	Dec.C MM	D.B.H.	D.B.H.
No.	Type	Class	Class	Plot Locations				M Acres	B.F.	B.F.	MM C.F.	MM C.F.	M Acres	B.F.	B.F.	MM C.F.	MM C.F.
18	Spruce-Fir	S-S	All	3		383	110	1			-	-	-				
19	Spruce-Fir	NS	-	2		000	27	1			-	-	-				
24	Dead Spruce	All	All			812	3,423	138			112	472	-				
Total Conifer Types				173				228	438	375	188	568	1			1	1
20	Aspen	SST	All	10		576	1,145	8			5	9					
21	Aspen	PT	All	22		278	186	152			42	28	4			1	1
22	Aspen	S-S	All	4		59	000	13			1	-					
Total Hardwood				36				173	-	-	48	37	4			1	1
Grand Total				209				401	438	375	236	605	5			2	2

Table 21

Summary of Total Area, Net Volume Per Acre and Total Volume By Species
For the Major Sawtimber Types

Types	Area Acres	Volume Per Acre	Species						Total
			Douglas-fir	Ponderosa Pine	Lodgepole Pine	Subalpine Fir	Engelmann Spruce	Aspen	
			M B.F.	M B.F.	M B.F.	M B.F.	M B.F.	M B.F.	M B.F.
Douglas-fir	11,743	4,931.01	49,522	4,634	1,327	816	1,518	88	57,905
Lodgepole Pine	833	6,674.05	1		4,550	472	508	28	5,559
Spruce-Fir	31,484	11,734.32	1,595		15,273	77,816	261,171	13,588	369,443
Aspen	7,585	6,294.33	382			8,323		39,037	47,742
Total	51,645	9,306.79	51,500	4,634	21,150	87,427	263,197	52,741	480,649

Table 22

Summary of Annual Growth and Mortality
For Sawtimber Types

Types	Area Acres	Board Feet in Trees 9.0" D.B.H. and Larger					Cubic Feet in Trees 5.0" D.B.H. and Larger				
		Per Acre			Total Annual	Total Annual	Per Acre			Total Annual	Total Annual
		Gross Growth	Mortality	Net Growth	Net Growth	Mortality	Gross Growth	Mortality	Net Growth	Net Growth	Mortality
		B.F.	B.F.	B.F.	M B.F.	M B.F.	C.F.	C.F.	C.F.	M C.F.	M C.F.
Douglas-fir	11,743	10.72	2.39	8.33	98	28	3.02	0.89	2.13	25	10
Lodgepole Pine	833	50.07	18.30	31.77	26	15	12.94	5.30	7.64	6	4
Spruce-Fir	31,484	124.27	49.41	74.86	2,357	1,556	30.52	14.63	15.89	500	461
Aspen	7,585	12.66	8.21	4.45	34	62	3.86	3.09	0.77	6	23
Total	51,645	80.86	32.16	48.70	2,515	1,661	20.04	9.64	10.40	537	498

Table 23

Average Net Volume Per Acre
By Crown Density Classes and Species

DOUGLAS-FIR SAWTIMBER TYPE

Species	Crown Density Classes						Percent of Species Based On	
	Medium (VS01)		Poor (VS02)		Average			
	Bd. Ft.	Cu.Ft.	Bd. Ft.	Cu. Ft.	Bd. Ft.	Cu. Ft.	Bd. Ft.	Cu. Ft.
Douglas-fir	5,970.53	2,027.16	3,755.56	1,041.36	4,217.17	1,246.80	85.53	87.27
Ponderosa Pine			498.51	102.97	394.62	81.51	8.00	5.71
Lodgepole Pine			142.71	29.45	112.97	23.31	2.29	1.63
Subalpine Fir	222.07	119.75	29.36	7.49	69.52	30.88	1.41	2.16
Engelmann Spruce	620.12	173.30			129.23	36.12	2.62	2.53
Aspen		27.42	9.48	5.41	7.50	10.00	0.15	0.70
Total	6,812.72	2,347.63	4,435.62	1,186.68	4,931.01	1,428.62	100.00	100.00

Area in Volume Stratum			
Acres	2,447	9,296	11,743
Percent	21	79	100.00

Note: Board Foot Volume in Trees 9.0" D.B.H. and Larger.
Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 24

Stock and Stand Table
By D.B.H. and Crown Density Classes

DOUGLAS-FIR SAWTIMBER TYPE

Average Per Acre

2" D.B.H. Class	Crown Density Classes: Medium (VS01) No. of Trees	Medium (VS01) Net Volume Scribner Dec. C	Medium (VS01) Net Volume Cubic Feet	Poor (VS02) No. of Trees	Poor (VS02) Net Volume Scribner Dec. C	Poor (VS02) Net Volume Cubic Feet	Weighted Average No. of Trees	Weighted Average Net Volume Scribner Dec. C	Weighted Average Net Volume Cubic Feet
1.0- 2.9									
3.0- 4.9									
5.0- 6.9	50.00		119.69	21.88		50.01	27.74		64.53
7.0- 8.9	58.33		363.24	18.75		87.90	27.00		145.28
9.0-10.9	83.33	2,383.99	819.12	18.75	540.00	188.35	32.21	924.28	319.80
11.0-12.9	24.17	1,210.95	337.49	10.63	470.53	134.46	13.45	624.83	176.76
13.0-14.9	16.66	1,482.05	353.18	8.12	616.66	153.70	9.90	797.01	195.27
15.0-16.9	5.00	665.97	147.71	5.63	643.43	147.49	5.50	648.13	147.54
17.0-18.9				1.87	285.16	62.64	1.48	225.73	49.59
19.0-20.9	0.83	335.79	66.74	1.57	315.30	65.70	1.42	319.57	65.92
21.0-22.9	0.83	280.66	55.25	0.31	63.75	13.50	0.42	108.95	22.20
23.0-24.9				0.94	389.75	74.96	0.74	308.53	59.34
25.0-26.9	0.83	453.31	85.21				0.17	94.47	17.76
27.0-28.9				0.31	224.29	41.85	0.25	177.55	33.13
29.0-30.9				1.25	739.75	138.15	0.99	585.59	109.36
31.0-32.9									
33.0-34.9				0.31	147.00	27.97	0.24	116.37	22.14
Total	239.98	6,812.72	2,347.63	90.32	4,435.62	1,186.68	121.51	4,931.01	1,428.62

Table 25

Average Net Volume Per Acre
By Crown Density Classes and Species

LODGEPOLE PINE SAWTIMBER TYPE

Species	Crown Density Classes								Percent of Species Based On	
	Well (VS03)		Medium (VS04)		Poor (VS05)		Weighted Average			
	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.
Douglas-fir			43.13	10.76			0.77	0.19	0.01	0.01
Lodgepole Pine	14,363.12	3,433.44	9,747.02	2,688.13	5,384.31	1,918.76	5,462.84	1,932.61	81.85	81.13
Subalpine Fir	3,026.77	866.91	575.77	320.57	566.38	227.47	566.55	229.15	8.49	9.62
Engelmann Spruce	1,255.12	373.01	2,028.41	647.14	583.35	189.86	609.36	198.09	9.13	8.32
Aspen	761.83	162.11			35.16	22.31	34.53	21.91	0.52	0.92
Total	19,406.84	4,835.47	12,394.33	3,666.60	6,569.20	2,358.40	6,674.05	2,381.95	100.00	100.00

Area in Volume Stratum			
Acres	15	818	833
Percent	2.[illegible]	98.[illegible]	100.00

Note: Board Foot Volume in Trees 9.0" D.B.H. and Larger.
Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 26

Stock and Stand Table
By D.B.H. and Crown Density Classes

LODGEPOLE PINE SAWTIMBER TYPE

Average Per Acre

2" D.B.H. Class	Crown Density Classes: Well (VS03) No.of Trees	Well (VS03) Net Volume Scribner Dec. C	Well (VS03) Net Volume Cubic Feet	Medium (VS04) No.of Trees	Medium (VS04) Net Volume Scribner Dec. C	Medium (VS04) Net Volume Cubic Feet	Poor (VS05) No.of Trees	Poor (VS05) Net Volume Scribner Dec. C	Poor (VS05) Net Volume Cubic Feet	Weighted Average No.of Trees	Weighted Average Net Volume Scribner Dec. C	Weighted Average Net Volume Cubic Feet
1.0- 2.9												
3.0- 4.9												
5.0- 6.9	100.00		419.03	80.77		364.78	101.79		430.57	101.41		429.39
7.0- 8.9	35.00		244.15	75.01		601.58	66.08		479.73	66.24		481.92
9.0-10.9	100.00	6,470.40	1,468.56	65.39	3,846.86	885.51	35.72	1,820.77	430.33	36.25	1,857.24	438.52
11.0-12.9	42.00	4,099.42	885.56	41.53	3,633.22	794.16	26.61	2,078.02	461.10	26.88	2,106.01	467.10
13.0-14.9	27.50	3,826.60	799.55	22.30	2,755.76	581.21	11.79	1,426.44	301.26	11.98	1,450.36	306.30
15.0-16.9	14.00	2,652.75	541.81	8.27	1,479.35	302.57	5.36	778.01	161.52	5.41	790.63	164.06
17.0-18.9	4.00	894.39	180.40	1.92	469.51	94.28	1.61	353.10	71.36	1.62	355.20	71.77
19.0-20.9	3.00	838.58	167.54	0.58	164.88	32.87	0.36	112.86	22.53	0.36	113.80	22.72
21.0-22.9	0.50	155.40	30.06	0.19	44.75	9.64					0.81	0.17
23.0-24.9	0.50	183.95	38.96									
25.0-26.9												
27.0-28.9												
29.0-30.9	0.50	285.35	59.85									
Total	327.00	19,406.84	4,835.47	295.96	12,394.33	3,666.60	249.32	6,569.20	2,358.40	250.15	6,674.05	2,381.95

Table 27

Average Net Volume Per Acre
By Crown Density Classes and Species

LODGEPOLE PINE POLETIMBER TYPE

Species	Crown Density Classes			Weighted Average	Percent By Species
	Well (VS12) Cu. Ft.	Medium(VS13) Cu.Ft.	Poor(VS14) Cu. Ft.	Cu. Ft.	
Douglas-fir	25.39	15.06		18.86	0.98
Lodgepole Pine	1,789.73	1,426.71	854.14	1,555.40	81.13
Subalpine Fir	131.31	21.81		77.54	4.05
Engelmann Spruce	36.34	20.62	5.80	27.31	1.42
Aspen	257.97	282.85		237.92	12.42
Total	2,240.74	1,767.05	859.94	1,917.03	100.00
Area in Volume Stratum					
Acres	6,328	4,247	1,334	11,909	
Percent	53.	36	11	100	

Note: Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 28

Stock and Stand Table
By D.B.H. and Crown Density Classes

LODGEPOLE PINE POLETIMBER TYPE

Average Per Acre

2" D.B.H. Class	Crown Density Classes: Well (VS12) No. of Trees	Well (VS12) Net Volume Cu. Ft.	Medium (VS13) No. of Trees	Medium (VS13) Net Volume Cu. Ft.	Poor (VS14) No. of Trees	Poor (VS14) Net Volume Cu. Ft.	Weighted Average No. of Trees	Weighted Average Net Volume Cu. Ft.
1.0- 2.9								
3.0- 4.9								
5.0- 6.9	112.49	415.87	72.73	244.77	40.00	155.33	90.19	325.65
7.0- 8.9	116.66	801.21	79.54	525.75	40.00	238.63	94.83	639.92
9.0-10.9	45.83	474.38	43.18	453.03	30.00	312.62	43.11	448.63
11.0-12.9	7.51	132.66	14.99	255.42	7.00	104.27	10.12	173.25
13.0-14.9	5.84	153.28	7.26	177.46	2.50	49.09	5.97	150.22
15.0-16.9	5.84	224.60	1.36	53.60			3.59	138.44
17.0-18.9	0.42	14.40	0.68	34.57			0.47	19.98
19.0-20.9	0.42	24.34	0.46	22.45			0.38	20.94
Total	295.01	2,240.74	220.20	1,767.05	119.50	859.94	248.66	1,917.03

Table 29

Average Net Volume Per Acre
By Stand Size Classes, Crown Density Classes and Species

SPRUCE-FIR SAWTIMBER TYPE

Species	Stand Size and Crown Density Classes: Large Sawtimber: Well & Med. (VS06) Bd.Ft.	Large Sawtimber: Well & Med. (VS06) Cu.Ft.	Small Sawtimber: Well (VS07) Bd.Ft.	Small Sawtimber: Well (VS07) Cu.Ft.	Small Sawtimber: Medium (VS08) Bd.Ft.	Small Sawtimber: Medium (VS08) Cu.Ft.	Small Sawtimber: Poor (VS09) Bd.Ft.	Small Sawtimber: Poor (VS09) Cu.Ft.	Weighted Average Bd.Ft.	Weighted Average Cu.Ft.	Percent of Species Based On Bd.Ft.	Percent of Species Based On Cu.Ft.
Douglas-fir	3,379.85	650.33			58.03	11.42	32.20	6.46	50.65	10.00	0.4	0.3
Lodgepole Pine			1,666.64	340.22	498.31	109.24	417.78	116.03	485.10	120.00	4.1	4.1
Subalpine Fir	1,229.19	515.07	4,397.76	1,214.02	2,769.69	889.21	2,187.74	662.39	2,471.62	764.22	21.1	25.9
Engelmann Spruce	12,275.44	2,620.69	12,862.69	2,677.03	12,049.04	2,627.58	5,644.64	1,422.69	8,295.35	1,918.07	70.7	65.0
Aspen	75.85	17.67			677.08	203.69	299.15	104.54	431.60	138.40	3.7	4.7
Total	16,960.33	3,803.76	18,927.09	4,231.27	16,052.15	3,841.14	8,581.51	2,312.11	11,734.32	2,950.69	100.0	100.0

Area in Volume Stratum				
Acres	90	964	11,852	18,578	31,484
Percent		3.	38.	59.	100.00

Note: Board Foot Volume in Trees 9.0" D.B.H. and Larger.
Cubic Foot Volume in Trees 5.0" D.B.H. and Larger.

Table 30

Stock and Stand Table

By D.B.H. and Crown Density Classes

SPRUCE-FIR SAWTIMBER TYPE

Average Per Acre

2" D.B.H. Class	Large Sawtimber Well & Medium (VS06) No.of Trees	Net Volume Scribner Dec. C	Net Volume Cubic Feet	Small Sawtimber Well (VS07) No.of Trees	Net Volume Scribner Dec. C	Net Volume Cubic Feet	Small Sawtimber Medium (VS08) No.of Trees	Net Volume Scribner Dec. C	Net Volume Cubic Feet	Small Sawtimber Poor (VS09) No.of Trees	Net Volume Scribner Dec. C	Net Volume Cubic Feet	Weighted Average No.of Trees	Net Volume Scribner Dec. C	Net Volume Cubic Feet
1.0- 2.9:															
3.0- 4.9:															
5.0- 6.9:	50.00		202.32	27.50		98.07	62.50		208.18	60.26		190.96	60.07		194.63
7.0- 8.9:	62.50		446.21	35.00		235.72	42.50		286.68	45.51		295.56	44.10		290.82
9.0-10.9:				37.50	1,902.00	470.58	40.01	1,960.41	480.39	26.92	1,209.65	305.47	32.09	1,509.91	375.48
11.0-12.9:	11.25	849.08	193.79	23.50	2,147.22	474.38	26.73	2,175.18	487.92	19.55	1,429.67	326.01	22.35	1,730.56	391.11
13.0-14.9:	6.25	792.00	170.49	20.25	2,711.46	574.27	17.99	2,397.65	507.43	11.48	1,334.15	286.43	14.18	1,775.02	378.09
15.0-16.9:	1.25	155.93	33.36	14.25	2,901.59	593.70	12.76	2,363.94	487.13	6.02	947.44	197.43	8.79	1,538.11	318.12
17.0-18.9:	3.75	696.98	145.34	8.25	2,107.95	425.49	8.58	2,153.72	436.01	4.23	993.08	201.65	5.99	1,463.20	296.55
19.0-20.9:	6.25	2,286.95	457.73	6.00	2,094.23	417.28	4.58	1,616.03	322.40	2.82	908.15	181.63	3.59	1,214.89	242.63
21.0-22.9:	1.25	698.50	129.90	5.00	2,117.36	408.17	2.58	1,147.91	222.07	1.15	437.00	85.88	1.81	756.77	147.13
23.0-24.9:	1.25	838.20	151.63	2.50	1,319.68	247.42	1.50	891.01	164.11	1.15	573.87	107.44	1.35	716.83	133.18
25.0-26.9:	6.25	4,561.30	813.62	0.75	446.22	81.58	0.91	568.66	103.79	0.51	337.97	61.17	0.68	440.36	80.02
27.0-28.9:	1.25	530.00	101.69	1.00	876.26	153.29	0.33	259.86	46.06	0.26	191.06	34.06	0.31	238.91	42.43
29.0-30.9:	1.25	1,619.20	272.89	0.25	302.72	51.32	0.25	221.52	38.69	0.25	219.47	38.42	0.25	226.85	39.60
31.0-32.9:	1.25	834.00	154.49				0.25	296.26	50.28				0.10	113.93	19.37
33.0-34.9:															
35.0-36.9:	1.25	2,115.19	349.99											6.13	1.01
37.0-38.9:	1.25	983.00	180.31											2.85	0.52
39.0-40.9:															
Total	156.25	16,960.33	3,803.76	181.75	18,926.69	4,231.27	221.47	16,052.15	3,841.14	180.11	8,581.51	2,312.11	195.66	11,734.32	2,950.69

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Table 31

Average Net Volume, Cubic Feet, Per Acre
By Stand Size Classes and Species

ASPEN TYPE

Species	Stand Size Classes: Sawtimber	Stand Size Classes: Poletimber	Weighted Average	Percent By Species
Aspen	1,337.30	310.56	362	68
Douglas-fir	21.07	41.42	40	8
Lodgepole Pine	--	4.31	4	1
Subalpine Fir	362.77	64.64	80	15
Engelmann Spruce	--	43.46	41	8
Total	1,721.14	464.39	527	100
Area in Volume Stratum				
Acres	8 M	152 M	160	
Percent	5	95	100	

Table 32

Stock and Stand Table
By Stand Size Classes and D.B.H. Classes

ASPEN TYPE

Average Per Acre

D.B.H. Classes		Sawtimber Type			Poletimber Type	
		No. of	Net Volume (VS20)		No. of	Net Volume (VS21)
10"	2"	Trees	Scribner Dec. C:	Cubic Feet	Trees	Cubic Feet
0	1.0- 2.9					
	3.0- 4.9					
1	5.0- 6.9	42.50		114.07	77.27	155.48
	7.0- 8.9	32.50		189.07	23.86	122.16
	9.0-10.9	27.50	1,063.05	272.92		
2	11.0-12.9	33.25	2,221.75	507.34	2.83	36.25
	13.0-14.9	16.25	1,613.72	349.75	1.82	37.78
	15.0-16.9	5.75	798.47	167.38	1.13	29.46
	17.0-18.9	1.75	339.00	69.52	0.33	11.77
	19.0-20.9	0.25	69.86	14.05	0.56	30.80
3	21.0-22.9	0.50	103.56	20.73	0.33	17.96
	23.0-24.9	0.25	84.92	16.31	0.11	7.46
	25.0-26.9					
	27.0-28.9					
	29.0-30.9					
4	31.0-32.9					
	33.0-34.9				0.11	15.27
Total		160.50	6,294.33	1,721.14	108.35	464.39

Table 33

Average Volumes Per Acre
By Species, Merchantability Class and D.B.H. Class
for the
DEAD SPRUCE TYPE

Cubic Feet

Species	Salvable Dead			Live		
	Trees 5.0-10.9" D.B.H.	Trees 11.0+ D.B.H.	Total	Trees 5.0-10.9" D.B.H.	Trees 11.0+ D.B.H.	Total
Engelmann Spruce	305	2,356	2,661	69	211	280
Subalpine Fir	106	204	310	194	340	534
Lodgepole Pine	66	214	280	46	70	116
Aspen	--	--	--	26	28	54
Total	477	2,774	3,251	335	649	984
Percent			77			23